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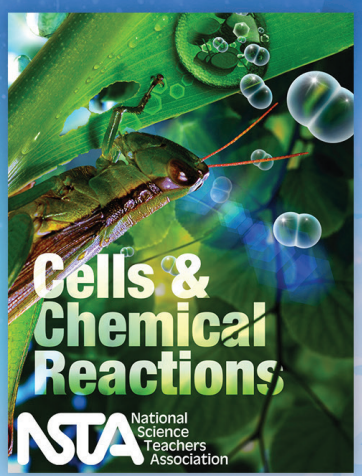
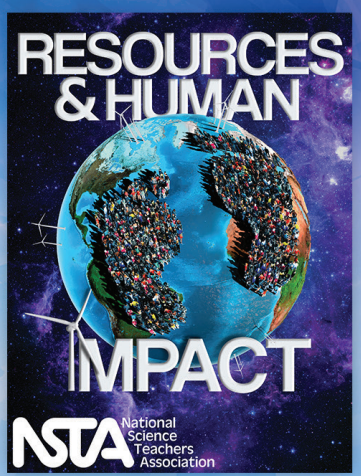
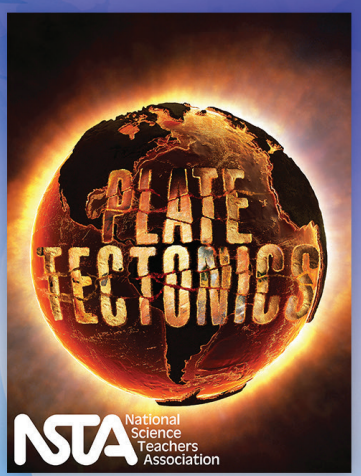
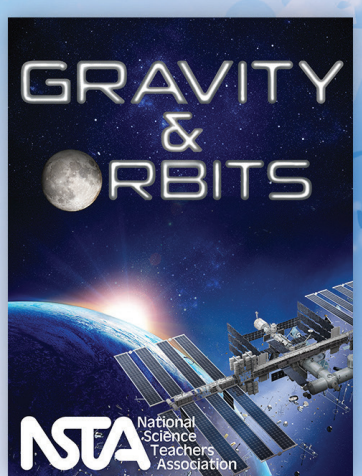
## Professional Learning

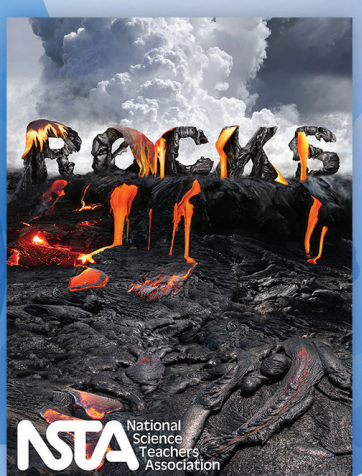




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# NSTA eBooks+

National Science Teachers Association

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## Professional Learning

- Atomic Structure
- Cell Division and Differentiation
- Cell Structure and Function
- Cells and Chemical Reactions
- Chemical Reactions
- Coral Reef Ecosystems
- Earth, Sun, and Moon
- Earth's Changing Surfaces
- Electric and Magnetic Forces
- Energy
- Explaining Matter with Elements, Atoms, and Molecules
- Flow of Matter and Energy in Ecosystems
- Force and Motion
- Gravity and Orbits
- Heredity and Variation
- Interdependence of Life
- Nature of Light
- Nutrition
- Ocean's Effect on Weather and Climate
- Plate Tectonics
- Resources and Human Impact
- Rocks
- Science of Food Safety
- Solar System
- Universe

Physical Sciences Life Sciences Earth & Space Sciences

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*—Middle school science and mathematics teacher*

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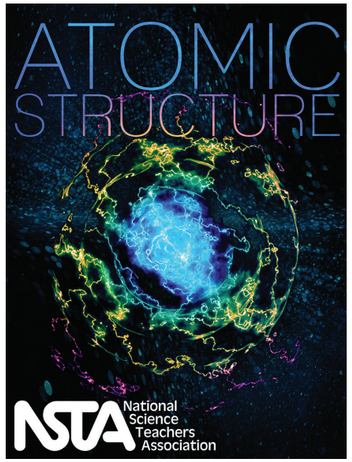


## Atomic Structure

- Investigating Atoms – The structure of an atom, including atomic particles and the atomic nucleus; atomic size and mass
- Properties of Atoms – How the structure of an atom determines properties of elements and how they interact with other elements; the role of neutrons on atomic mass and stability; radioactivity
- Energy in Atoms – Quarks; forces that hold together atoms; nuclear reactions

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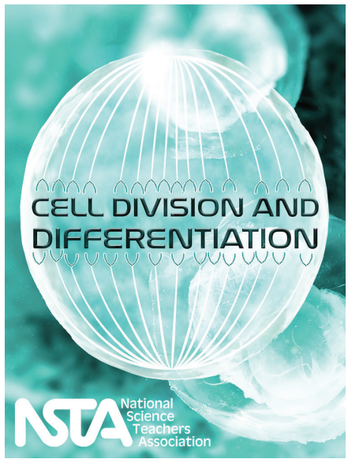


## Cell Division and Differentiation

- Continuity of Life – Purpose, process, and control of cell division
- Variation and Specialization of Cells – Stem cells versus differentiated cells; process and purpose of differentiation; cell-to-cell communication
- Multicellular Organization – Embryonic development and organogenesis; types of plant and animal tissues; embryonic versus somatic stem cells; stem cell treatment

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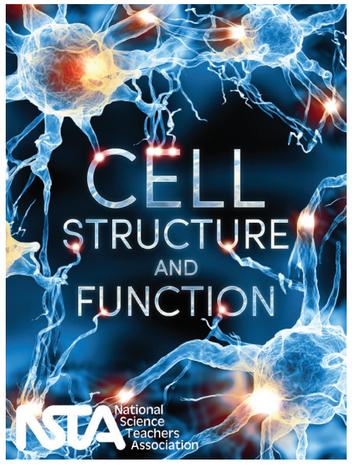


## Cell Structure and Function

- The Basis of Life – Criteria of living and nonliving things; importance of surface area; classification of life-forms
- The Cellular Factory – Organelle functions; organelles' connection to proteins; cell specialization
- The Molecular Machinery of Life – How water, proteins, carbohydrates, lipids, and nucleic acids are used by cells; the importance of carbon in macromolecules; how cells obtain and store the energy for cellular processes
- The Most Important Molecule – The role of proteins and amino acids; how ribosomes carry out the synthesis of proteins in the cell; the role of proteins outside cells

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## Cells and Chemical Reactions

- Basics of Metabolism – How energy is used in cells; synthesis and decomposition of molecules during metabolism; the role of enzymes
- Photosynthesis – The importance of chloroplasts and chlorophyll; how chloroplasts capture sunlight to synthesize organic molecules for energy storage
- Cellular Respiration – How cells use molecules for energy and the function of ATP
- Reaction Rates in Cells – How different environmental conditions, such as temperature, pH, and pressure affect reaction rates; enzymes

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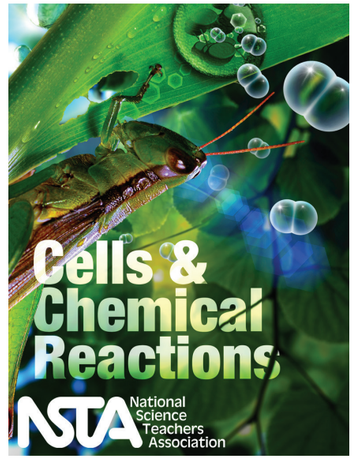


## Chemical Reactions

- A World of Reactions – Common reactions; reactivity; bonding
- Categorizing Chemical Reactions – Metal reactivity; oxidation-reduction reactions; acids and bases; free radicals
- Rates of Chemical Reactions – Reaction rates; effect of concentration, pressure, temperature, and shape; catalysts
- Matter and Energy in Reactions – Conservation of mass; conservation of energy; endothermic and exothermic reactions; initiating reactions; energy profile

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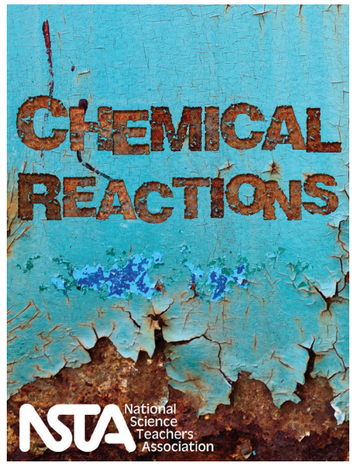


## Coral Reef Ecosystems

- The Living Reef – Coral types, anatomy, reproduction, and growth; a reef system and inhabitants
- The Abiotic Setting – Effects of waves and ocean movement, temperature, light, and chemicals
- Interdependence – Food chains, food webs, organism relationships, flow of energy and matter, ecological succession
- Ecosystems in Crisis – Natural disasters, manmade disasters, stewardship

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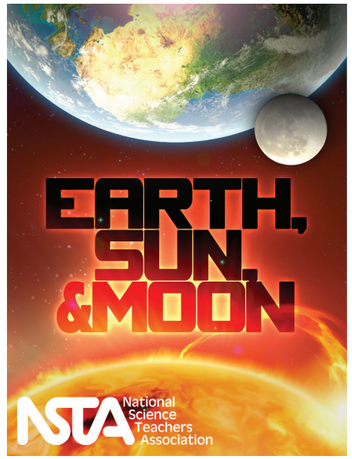


## Earth, Sun, and Moon

- General Characteristics of Earth – Historic observations of Earth; measuring Earth; Earth's spheres; habitable zone
- Our Moving Earth – Historic observations of the Earth's movements, orbit, and rotation
- Motion of the Moon – The Moon's orbit, phases, and eclipses
- Earth's Seasons – Elliptical orbit; Sun and energy; the Earth's tilt

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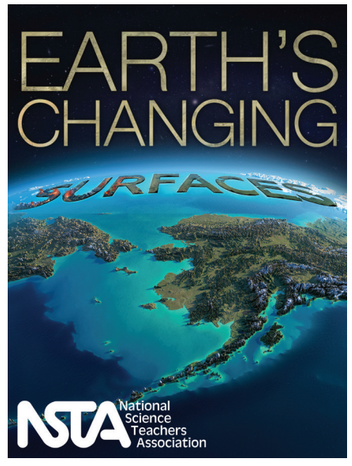


## Earth's Changing Surfaces

- Changing Earth from Within – Sources of heat energy within Earth; the location and motion of Earth's plates; how plate motion affects Earth's structures
- Sculpting the Landscape – Different landforms; how constructive and destructive processes shape the land; rates of landform change from these processes
- Humans as Agents of Change – How human activities influence the rate and type of landscape evolution and the resulting effects, including climate change, sea level change, and glacial retreat

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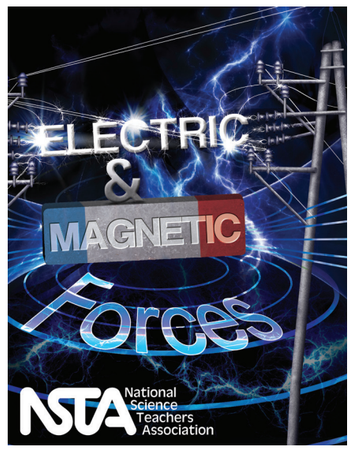


## Electric and Magnetic Forces

- Electric Charges – Static electricity, electric forces, electric charges, atomic theory and structure, lightning
- Electrostatics and Current Electricity – Currents, movement of charges, energy calculations, circuits, conductivity
- Electromagnetism – Magnetic materials, electromagnets, electric and magnetic fields

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## Energy

- Different Kinds of Energy – Forms of energy and calculating energy
- Energy Transformation – Following the energy; representing energy with numbers; conservation of energy
- Thermal Energy, Heat, and Temperature – Understanding the differences between heat and temperature; heat transfer
- Useful and Not So Useful Energy – Efficiency and entropy

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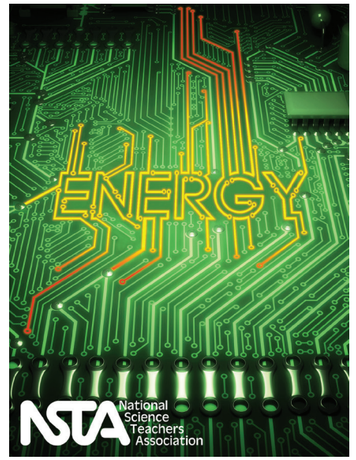


## Explaining Matter with Elements, Atoms, and Molecules

- Characteristics of Elements – Characteristic properties; reactions between elements; conservation of mass
- Classifying the Elements – Grouping elements; arrangement of elements in the periodic table; properties of groups of elements; predicting new elements
- Evidence for Atoms and Molecules – Evidence for atoms; explaining reactions with atoms; phases of matter

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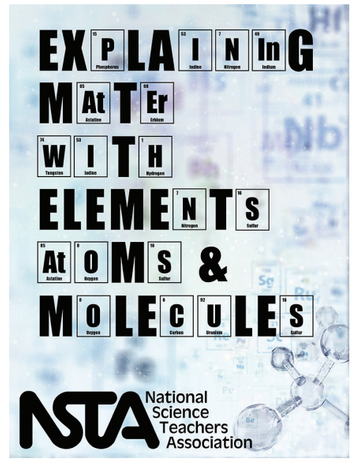


## Flow of Matter and Energy in Ecosystems

- Does Matter Matter? – Components of an ecosystem; distribution of matter; conservation of matter
- Carbon, Carbon Everywhere – Structure and importance of carbon; carbon cycle; fossil fuels and climate change
- Nothing Matters Without Energy – Food chains and webs; energy transformations in an ecosystem; energy from the Sun; alternative sources of energy; conservation of energy

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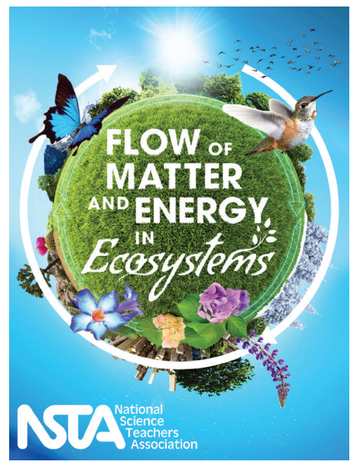

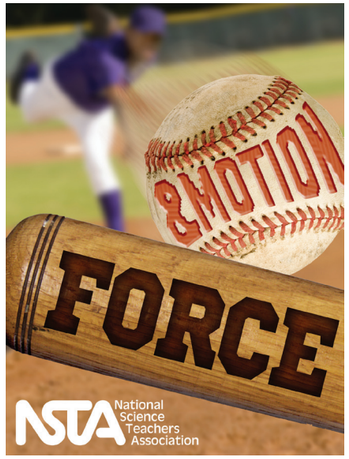


## Force and Motion

- Position and Motion – Position of objects; motion of objects; and the change in motion of objects
- Newton's First Law – Objects at rest, objects in motion, friction, and inertia
- Newton's Second Law – Inertia; net force's relationship to mass and motion; friction; different kinds of forces in relation to net force
- Newton's Third Law – What happens if an object exerts a force on another object; what action-reaction means; figuring out what forces are acting on which objects

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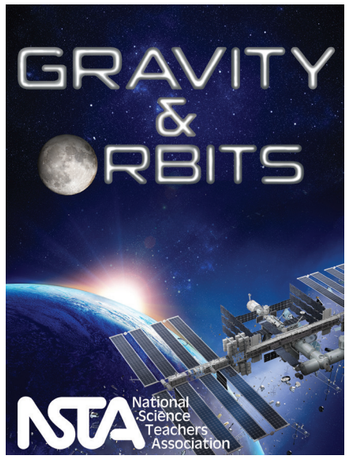


## Gravity and Orbits

- Universal Gravitation – Every object exerts a gravitational force on every other object; gravitational force is hard to detect unless one of the objects has a lot of mass; any two objects will exert equal gravitational force on one another; gravity is the force behind falling rain and flowing rivers
- Gravitational Force – The variables that influence gravitational forces on objects; mass as a measure of matter and weight as a measure of gravitational force; the strength of gravitational forces between objects
- Orbits – Gravitational force influences the motion of orbiting objects; how an object's forward motion and motion toward center creates a curved path; how gravity governs the motion of all objects in the Solar System

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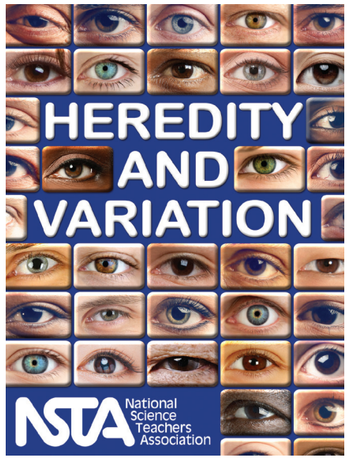


## Heredity and Variation

- Inheritance – Mendel and his experiments; probability; graphic analysis
- Genes in Action – DNA's composition and role; meiosis
- Mutation Provides Variation – Natural variation; what are mutations; detection of mutations

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## Interdependence of Life

- Organisms and Their Environment – Earth's spheres; ecosystems; abiotic and biotic factors; population characteristics; limiting factors; carrying capacity
- Species Relationships – Competition, symbiosis, and predation; food chains and webs
- Population Balance in Biomes – Biomes; dynamic equilibrium
- Agents of Change in Ecosystems – Natural disasters; human impact; ecological succession

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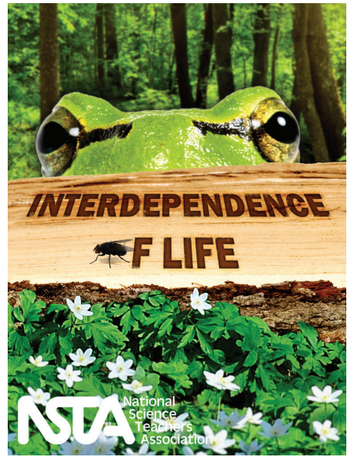


## Nature of Light

- Characteristics of Light – Mirrors; reflection, refraction, and diffraction
- Light as Waves – Waves; wave behavior; electromagnetic spectrum
- Light and Color – Prisms; light perception; light filters; light scattering; primary colors
- So, what is Light? – Waves; photons; emission and absorption spectra

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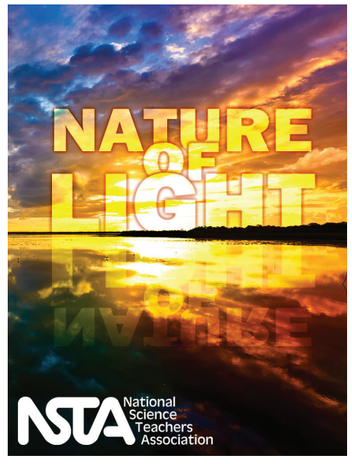


## Nutrition

- What is Food? - Why food is important for body processes; classification of nutrients as carbohydrates, fats, proteins, vitamins, minerals, and water
- What Happens to the Food I Eat? - Digestion; organ systems and how they work together to transport nutrients and eliminate waste; how cells use nutrients
- What are Nutrients? – The body's nutrient use; undernutrition and malnutrition; sources for dietary advice; the importance of water
- What Choices Lead to a Healthy Lifestyle? – Calculating energy needs; factors affecting food choices; using food labels

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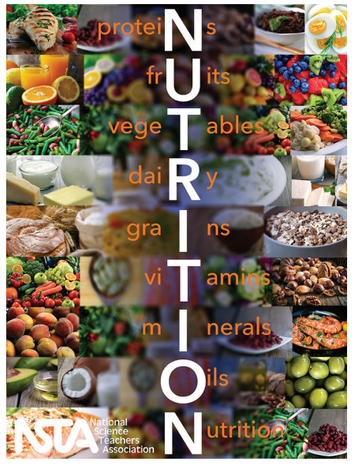

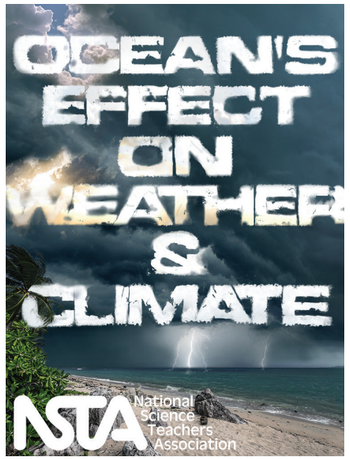


## Ocean's Effect on Weather and Climate

- Global Climate Patterns – Weather; climate; solar energy; convection; the Coriolis effect
- Global Precipitation and Energy – The water cycle; water on Earth; transfer of thermal energy in the water cycle
- Global Circulation Patterns – Ocean currents and their effect on weather; hurricanes; La Niña, El Niño, and the North Atlantic Oscillation
- Changing Climate – Studying past climate; mechanisms that affect climate, including human-induced climate change; monitoring climate change

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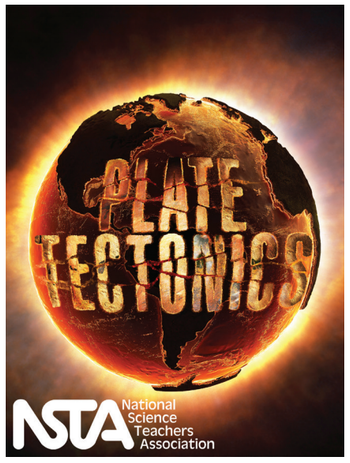


## Plate Tectonics

- Layered Earth – The layers of Earth; characteristics of the various layers of Earth; using how waves travel through layers to illustrate the differences in each layer
- Plates – Types of plates; how plates make up the Earth's continents and oceans' basins; continental and oceanic crust; movement of plates; convection circulation in mantle
- Plate Interactions – Plate interactions can cause earthquakes, volcanoes, mountain formation, deep ocean trenches, and sea floor spreading; areas along plate margins are active; causes of plate movement
- Consequences of Plate Interactions – The different plate boundaries and consequences
- Lines of Evidence – Physical, geographical, and geological evidence for the theory of continental drift and plate tectonics

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## Resources and Human Impact

- Earth as a System – Interactions in an ecosystem; population growth; carrying capacity; feedback loops
- Population Growth, Technology, and the Environment – Human population growth; limiting factors; impact of technology on population growth; salmon and freshwater case studies
- Environmental Degradation – Renewable and nonrenewable resources; extracting resources; impact of resource use
- Using Technology to Address Resource Use Issues – Humans' environmental responsibility; social, political, and economic factors associated with technology and resource use; potential environmental risks of and solutions to using technology; alternative energy

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## Rocks

- Categories by Process – Introduction to the formation and characteristics of rocks
- Environments of Formation – The processes that result in the formation of igneous, sedimentary, and metamorphic rocks
- Cycling – The processes of rock formation and movement of matter in the Earth system
- Earth's Autobiography – The tools and processes for determining age of rocks; how scientists interpret the past; how observations of rocks provide evidence for the environment in which rock was formed

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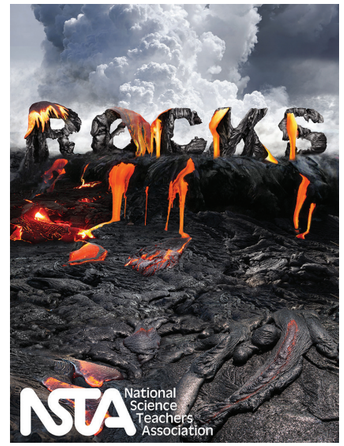


## Science of Food Safety

- Understanding the Cell's Importance – Cell structure; where bacteria live; good and bad bacteria
- Growth and Reproduction of Cells – Cell metabolism; cell division; bacterial adaptations to environmental conditions
- Microbes... Friend or Foe – Beneficial and dangerous bacteria; viruses; the immune system
- Food Safety and You – Technology, methods, and historical understanding of food safety

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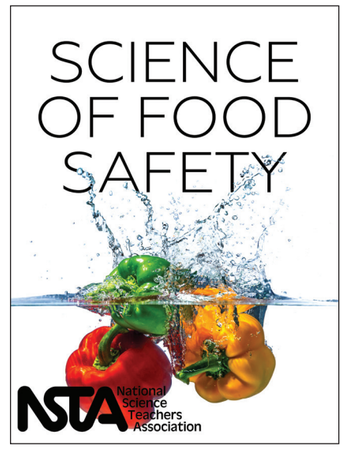


## Solar System

- Earth in Space – Position of the Earth, Sun, and Moon; astronomers' historical observations and theories; retrograde motion; technology for observing the Solar System
- A Look at the Planets – Technology for observing the Solar System; astronomers' historical evidence; the planets and their characteristics; Kuiper Belt; moons
- Asteroids, Comets, and Meteorites – Classification; interactions with other celestial bodies, including collisions; technology for observing the Solar System
- Formation of Our Solar System – Solar System formation theories

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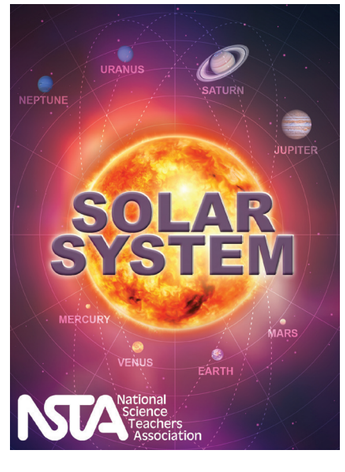

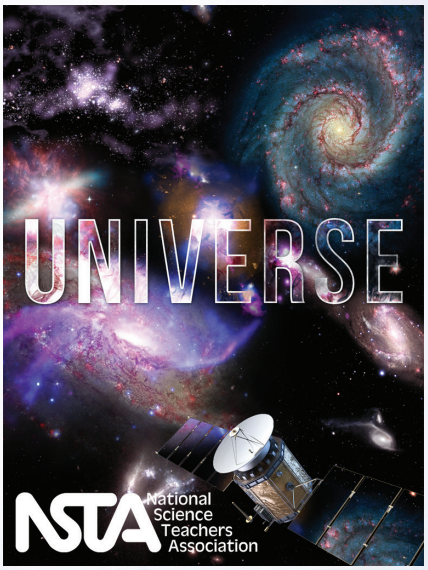


## Universe

- How We Know What We Know – Telescopes and other tools; light spectrums; electromagnetic radiation
- The Sun as a Star – Properties of stars; measuring properties of stars
- The Birth, Life, and Death of Stars – Life cycle of stars; stellar characteristics
- The Universe Beyond Our Solar System – Distance of objects; parallax; galaxies and organization of the universe
- The Origin and Evolution of the Universe – Big Bang theory and its evidence

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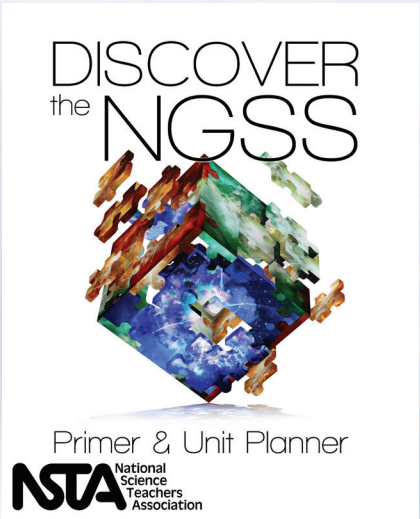


## Discover the *NGSS*: Primer and Unit Planner

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The book's first module undertakes an exploration of the three dimensions of the *NGSS*—the science and engineering practices, disciplinary core ideas, and crosscutting concepts. Using numerous interactive elements, learners analyze classroom videos, answer questions, and develop arguments from evidence while becoming proficient at understanding the structure and significance of the three dimensions. In the second module, users integrate the three dimensions into performance expectations. Multiple interactive tools are used to help augment comprehension. In the third module, learners apply the knowledge gleaned from previous segments to plan units of study and learn how to assess whether a given curriculum aligns to the *NGSS*.

Finally, try out the Unit Planner! Grade-specific drop-down menus guide you step by step through the process of organizing and developing an *NGSS* unit of study.

Whether you need a quick refresher or a deeper dive into the standards, *Discover the* NGSS provides an organizational structure and a richness of interactivity from which all learners can benefit.

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